

## Ch 6 Notes B.ink

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Ch 6 Binding

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Chemical Bond - Link b/w atoms that results from a mutual attraction of 1 atom's nucleus for another atom's  $e^-$ 's (vice versa)

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Covalent

ionic

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Covalent  
 $e^-$  shared b/w atoms

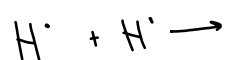
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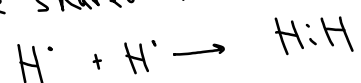
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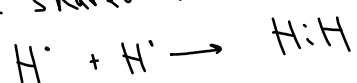


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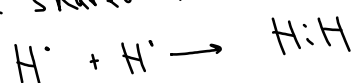


Ionic  
attraction b/w oppositely charged  
ions (+ & -)

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Chemical Bond - Link b/w atoms that results  
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 $e^-$  shared b/w atoms



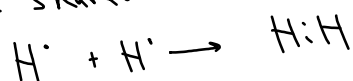
Ionic  
attraction b/w oppositely charged  
ions (+ & -)  
ions form through  $e^-$  transfer



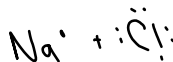
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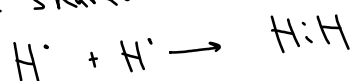
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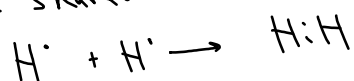
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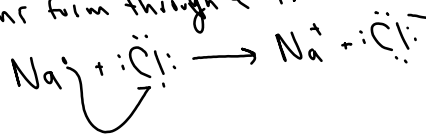
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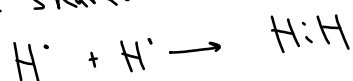
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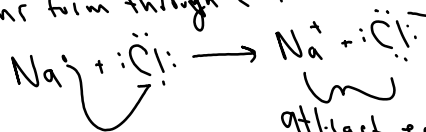
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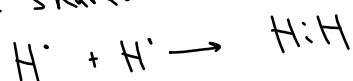


attract each other  
& form an ionic bond.

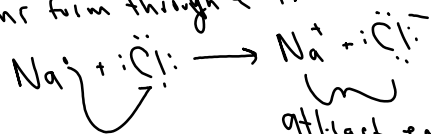
## Ch 6 Binding

Chemical Bond - Link b/w atoms that results from a mutual attraction of each atom's nucleus for another atom's  $e^-$ 's (vice versa)

Covalent - form b/w 2 or more nonmetals  
 $e^-$  shared b/w atoms



Ionic  
 attraction b/w oppositely charged ions (+ & -)  
 ions form through  $e^-$  transfer

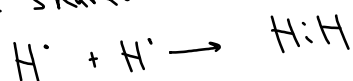


attract each other & form an ionic bond.

## Ch 6 Bonding

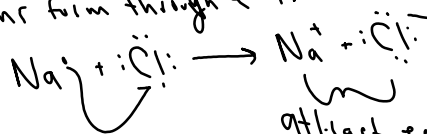
Chemical Bond - Link b/w atoms that results from a mutual attraction of atom's nucleus for another atom's  $e^-$ 's (vice versa)

Covalent - form b/w 2 or more nonmetals  
 $e^-$  shared b/w atoms



Ionic - form b/w metal + nonmetal

attraction b/w oppositely charged ions (+ & -)  
 ions form through  $e^-$  transfer



attract each other & form ionic bond.

All  $c$  are not shared equally.

All  $e^-$  are not shared equally.  
↳ Sharing can vary based on differences in  
e-neg's b/w elements



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<u># difference</u>	<u>Dif in electr</u>	<u>Type of Bond</u>	<u><math>\Sigma x</math></u>
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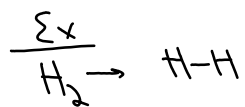
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<u># difference</u>	<u>Dif in neg</u> small difference	<u>Type of Bond</u>	<u><math>\Sigma x</math></u>
---------------------	---------------------------------------	---------------------	------------------------------

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# difference   Dif in neg  
                    small difference

Type of Bond

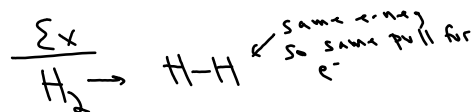


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# difference	Dif in neg small difference	Type of Bond nonpolar covalent	$\frac{\Sigma x}{H_2} \rightarrow H-H$
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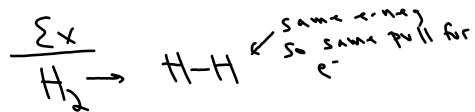


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0.0-0.3	small difference	nonpolar covalent



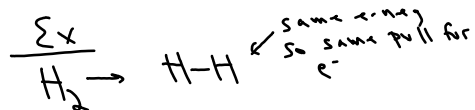
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# difference	Diff in neg	Type of Bond
0.0-0.3	Small difference	nonpolar covalent
	Medium Difference	





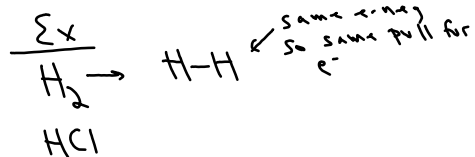
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	Medium Difference

Type of Bond
nonpolar
covalent

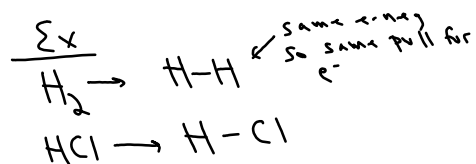


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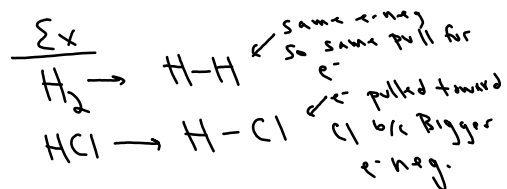
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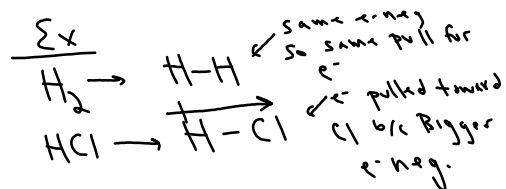
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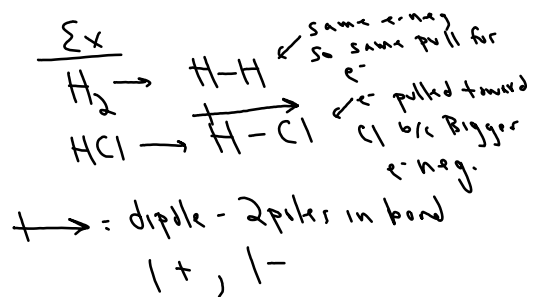
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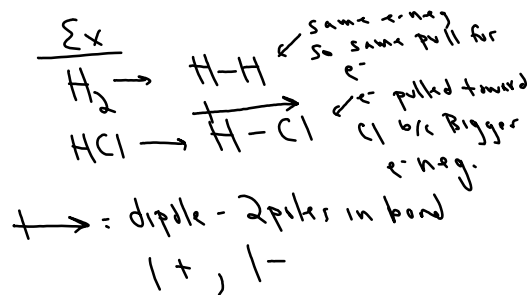
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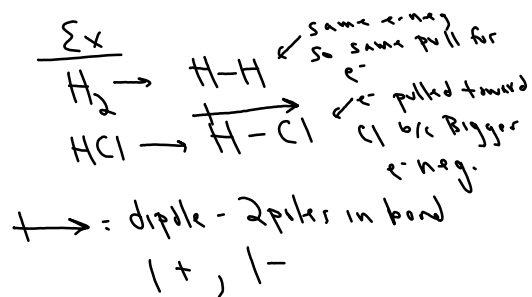
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0.0-0.3	Small difference	nonpolar covalent
	Medium Difference	Polar Covalent



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# difference	Diff in electr	Type of Bond
0.0 - 0.3	Small difference	nonpolar covalent
0.3 - 1.7	Medium Difference	Polar Covalent

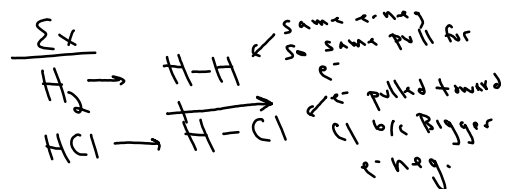


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# difference	Diff in e <sup>-</sup> neg	Type of Bond
0.0 - 0.3	Small difference	nonpolar covalent
0.3 - 1.7	Medium Difference	Polar Covalent

BIG Diff

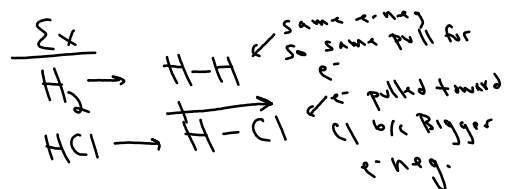




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# difference	Diff in electr	Type of Bond
0.0 - 0.3	Small difference	nonpolar covalent
0.3 - 1.7	Medium Difference	Polar Covalent
1.7 - 4.0	BIG Diff	Ionic Bond

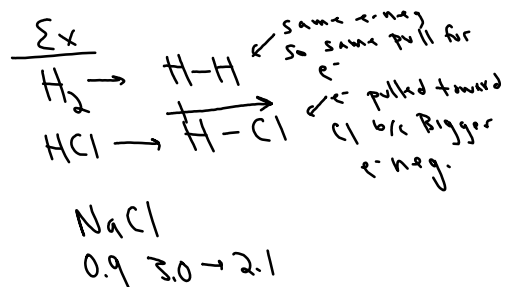


## Ch 6 Notes B.ink

All  $e^-$  are not shared equally.

( $\hookrightarrow$ ) Sharing can vary based on differences in  $e^-$  neg's b/w elements

# difference	Diff in $e^-$ neg	Type of Bond
0.0 - 0.3	Small difference	nonpolar covalent
0.3 - 1.7	Medium Difference	Polar Covalent
1.7 - 4.0	BIG Diff	Ionic Bond



## Ch 6 Notes B.ink

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why do Bonds firm?

why do Bonds form?  
↳ so that atoms become more stable

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↳ when they have full outer shell of e.

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Min Define RE + BondLength!

Bond Length - dist b/w 2 nuclei  
of Bonded atoms



Bond Length - dist b/w 2 nuclei  
of Bonded atoms

Bond Energy -

Bond Length - dist b/w 2 nuclei  
of Bonded atoms

Bond Energy - E req'd to break a chemical  
Bond

Bond Length - dist b/w 2 nuclei  
of Bonded atoms

Bond Energy - E req'd to break a chemical  
Bond

Inverse  
Relation

Bond Length - dist b/w 2 nuclei  
of Bonded atoms

Bond Energy - E req'd to break a chemical  
Bond

Inverse  
Relation

BL↓, BE↑

Depicting Molecules . "Structures of Molecules"

Depicting Molecules . "Structures of Molecules"

Octet Rule

Depicting Molecules . "Structures of Molecules"

Octet Rule - bonds form by gaining, losing, or sharing e<sup>-</sup>  
so that each atom has a full outer shell of e<sup>-</sup>

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Show covalent bonds w/ Lewis structures

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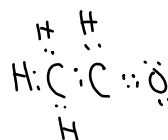
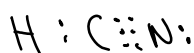
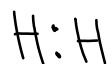
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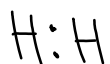
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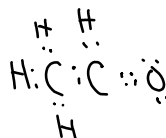
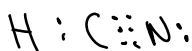
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Show covalent bonds w/ Lewis structures



↑  
shared e<sup>-</sup> pair  
Bond

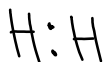


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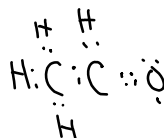
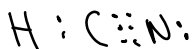
Octet Rule - bonds form by gaining, losing, or sharing  $e^-$   
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Show covalent bonds w/ Lewis structures

1 bond =  $2e^-$



↑  
shared  $e^-$  pair  
Bond

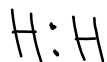


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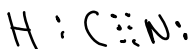
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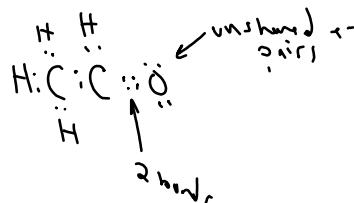
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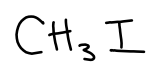
↑  
3 bonds



Drawing Lewis Structures

Drawing Lewis Structures

Draw the structure of iodo methane

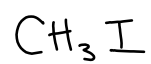




Drawing Lewis Structures

1. Find the total valence from all the atoms

Draw the structure of iodomethane

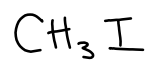


Drawing Lewis Structures

1. Find the total val<sup>e-</sup> from all the atoms

$$\text{C: } 1 \times 4 \text{ val}^e = 4e^-$$

Draw the structure of iodomethane

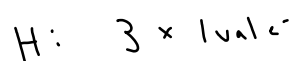
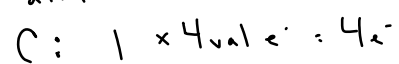


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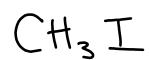
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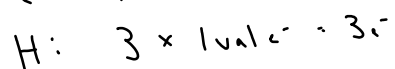
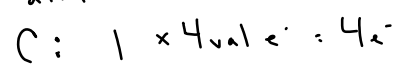


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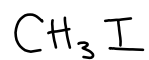
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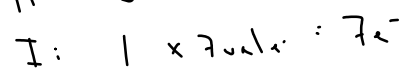
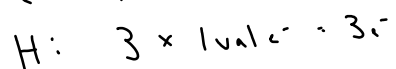
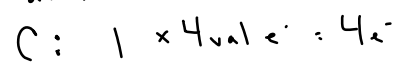


Draw the structure of iodomethane

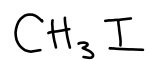


Drawing Lewis Structures

1. Find the total val<sup>e-</sup> from all the atoms



Draw the structure of iodo methane

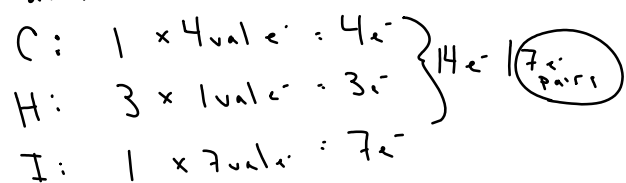


## Ch 6 Notes B.ink

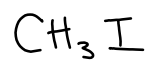
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Drawing Lewis structures

1. Find the total val<sup>e-</sup> from all the atoms

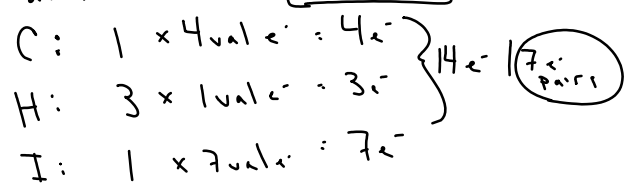


Draw the structure of iodo methane

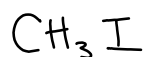


Drawing Lewis structures

1. Find the total val<sup>e-</sup> from all the atoms → 7e<sup>-</sup> pairs



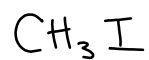
Draw the structure of iodo methane



Drawing Lewis Structures

1. Find the total valence from all the atoms  $\rightarrow$  7e<sup>-</sup> pairs
2. Arrange atoms in a simple layout for the molec.

Draw the structure of iodomethane

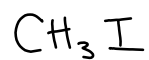




Drawing Lewis Structures

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H is NEVER in middle

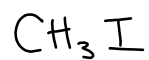
Draw the structure of iodo methane



Drawing Lewis Structures

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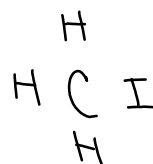
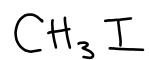
Draw the structure of iodo methane



### Drawing Lewis Structures

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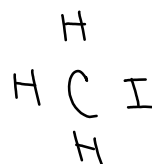
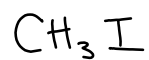
Draw the structure of iodo methane



### Drawing Lewis Structures

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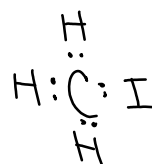
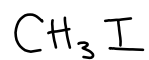
Draw the structure of iodo methane



### Drawing Lewis Structures

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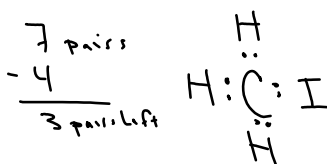
Draw the structure of iodo methane



### Drawing Lewis Structures

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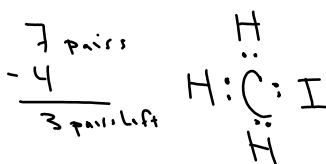
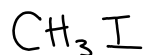
Draw the structure of iodo methane



### Drawing Lewis Structures

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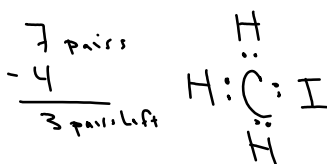
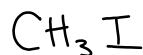
Draw the structure of iodo methane



### Drawing Lewis Structures

- Find the total valence from all the atoms  $\rightarrow$  7 e<sup>-</sup> pairs
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  - Now put e<sup>-</sup> pairs around each nonmetal (NOT H) to give them an octet

Draw the structure of iodo methane

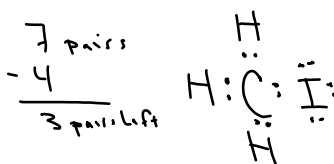
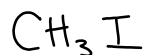




## Drawing Lewis Structures

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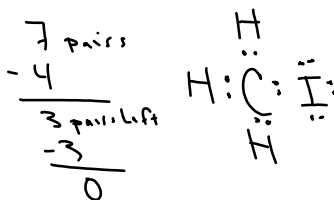
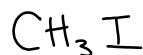
Draw the structure of iodo methane



## Drawing Lewis Structures

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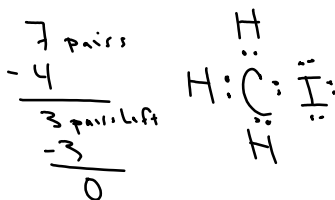
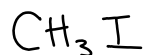
Draw the structure of iodo methane



## Drawing Lewis Structures

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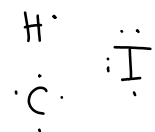
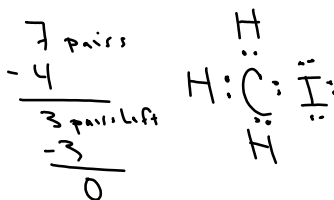
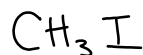
Draw the structure of iodo methane



## Drawing Lewis Structures

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Draw the structure of iodomethane

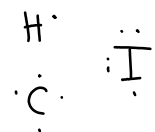
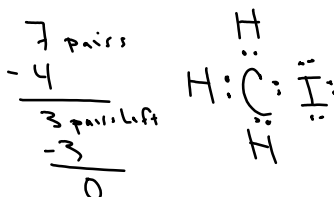
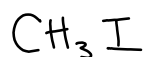


## Ch 6 Notes B.ink

### Drawing Lewis Structures

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Draw the structure of iodomethane



### Drawing Lewis Structures

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- 4 Check Math If too many <sup>e-</sup> in structure  
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Draw the structure of 1000 methane

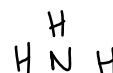


### Drawing Lewis Structures

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Draw the structure of 1000 methane

NH<sub>3</sub> 4<sup>e-</sup> pairs



## Ch 6 Notes B.ink

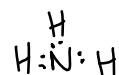
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### Drawing Lewis Structures

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Draw the structure of 1000 methane

NH<sub>3</sub> 4e<sup>-</sup> pairs





## Ch 6 Notes B.ink

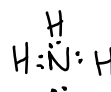
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### Drawing Lewis Structures

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Draw the structure of 1000 methane

NH<sub>3</sub> 4e<sup>-</sup> pairs



C<sub>2</sub>H<sub>6</sub>

## Ch 6 Notes B.ink

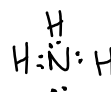
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### Drawing Lewis Structures

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Draw the structure of 1000 methane

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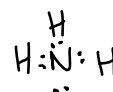
C<sub>2</sub>H<sub>6</sub>

### Drawing Lewis Structures

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Draw the structure of 1000 methane

NH<sub>3</sub> 4e<sup>-</sup> pairs



C<sub>2</sub>H<sub>6</sub> → 14e<sup>-</sup> → 7e<sup>-</sup> pairs

## Ch 6 Notes B.ink

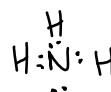
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### Drawing Lewis Structures

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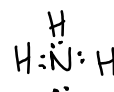


## Drawing Lewis Structures

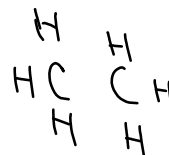
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Draw the structure of 1000 methane

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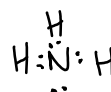
## Ch 6 Notes B.ink

### Drawing Lewis Structures

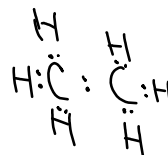
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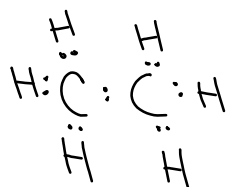
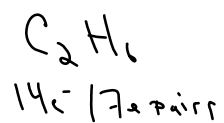
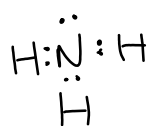
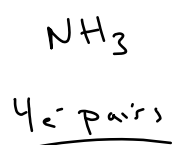
Draw the structure of 1000 methane

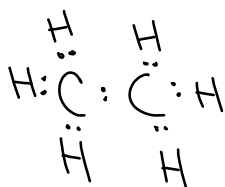
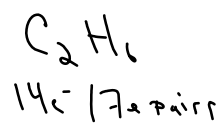
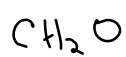
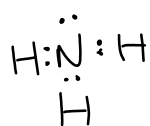
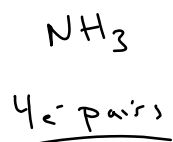
NH<sub>3</sub> 4e<sup>-</sup> pairs



C<sub>2</sub>H<sub>6</sub> → 14e<sup>-</sup> → 7e<sup>-</sup> pairs



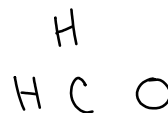
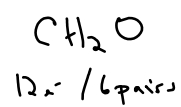
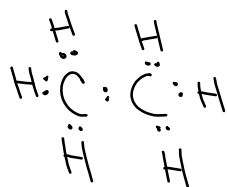
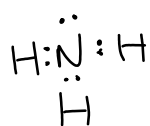
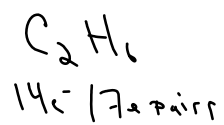
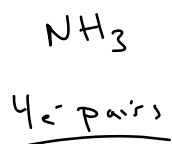






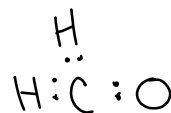
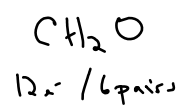
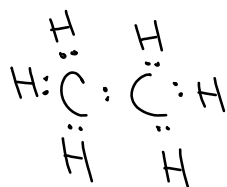
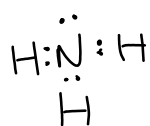
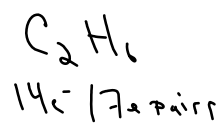
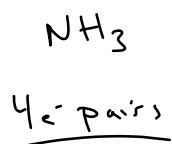
## Ch 6 Notes B.ink

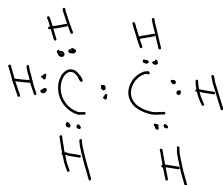
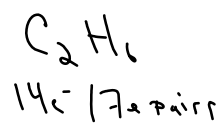
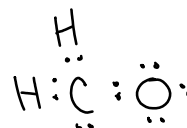
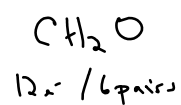
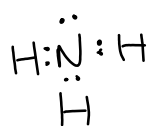
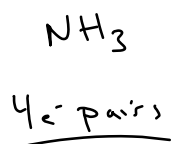
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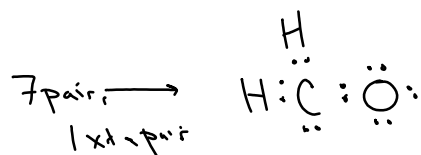
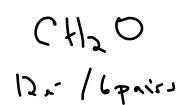
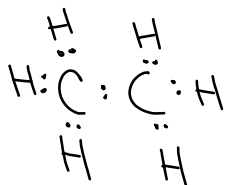
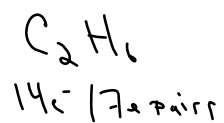
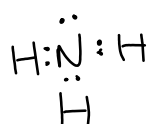
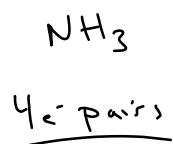


## Ch 6 Notes B.ink

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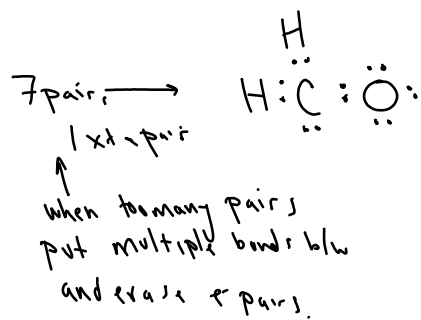
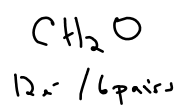
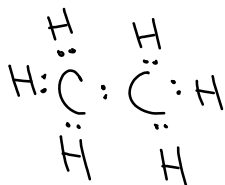
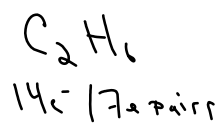
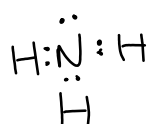
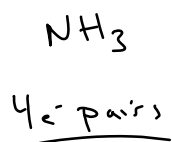




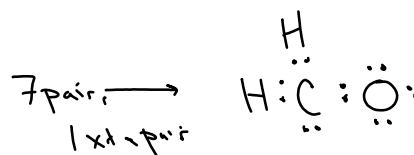
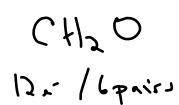
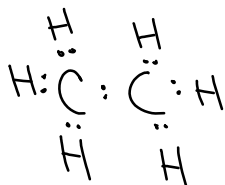
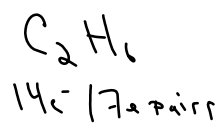
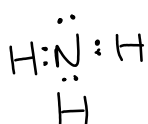
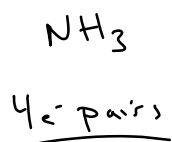


## Ch 6 Notes B.ink

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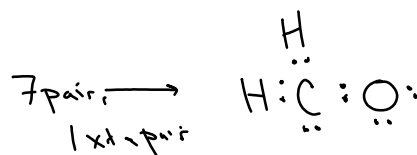
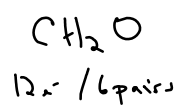
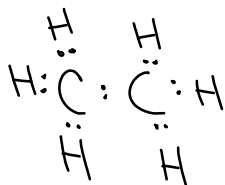
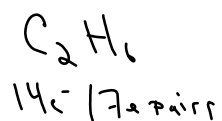
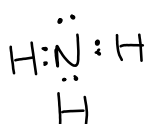
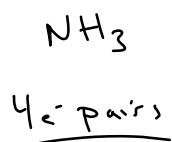


## Ch 6 Notes B.ink



↑  
when too many pairs  
put multiple bonds b/w  
and erase e<sup>-</sup> pairs.

1 pair is erased

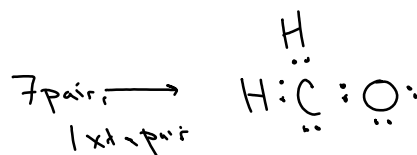
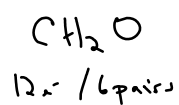
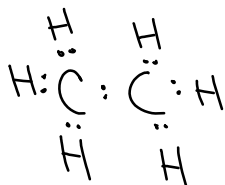
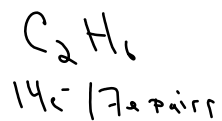
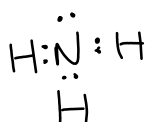
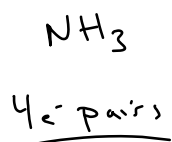


1 x 2 pair

↑  
 when too many pairs  
 put multiple bonds b/w  
 and erase e<sup>-</sup> pairs.

1 pair is erased

## Ch 6 Notes B.ink

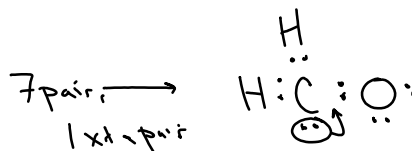
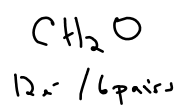
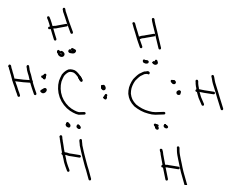
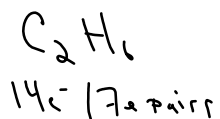
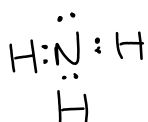
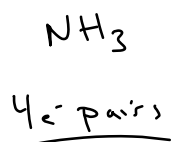


when too many pairs  
put multiple bonds b/w  
and erase e<sup>-</sup> pairs.

1 pair is erased  
Rearrange pairs  
to give octet.



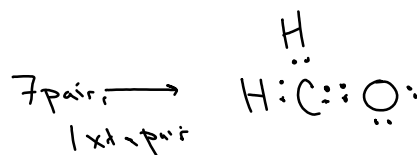
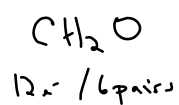
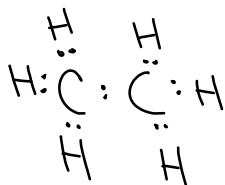
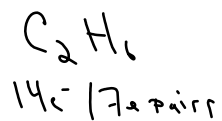
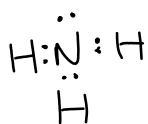
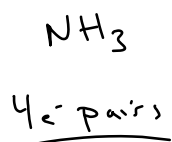
## Ch 6 Notes B.ink



when too many pairs  
put multiple bonds b/w  
and erase e<sup>-</sup> pairs.

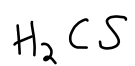
1 pair is erased  
Rearrange pairs  
to give octet.

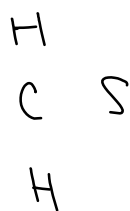
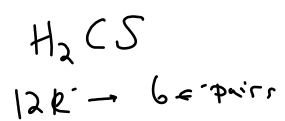
## Ch 6 Notes B.ink



when too many pairs  
put multiple bonds b/w  
and erase e<sup>-</sup> pairs.

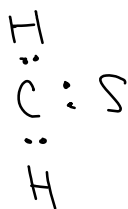
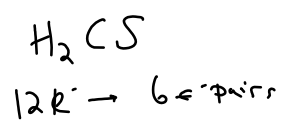
1 pair is erased  
Rearrange pairs  
to give octet.

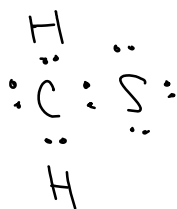
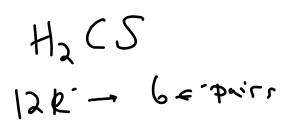


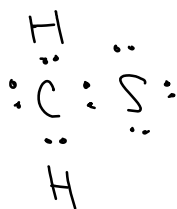
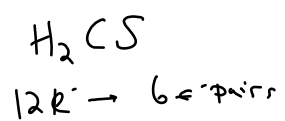


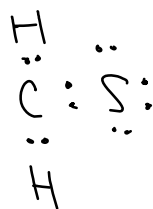
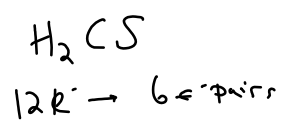
## Ch 6 Notes B.ink

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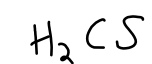




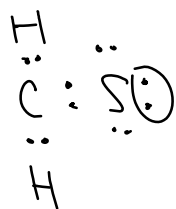


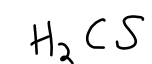




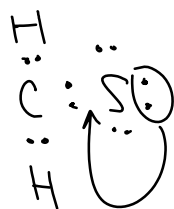


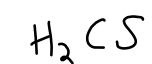
12e<sup>-</sup> → 6 e<sup>-</sup> pairs



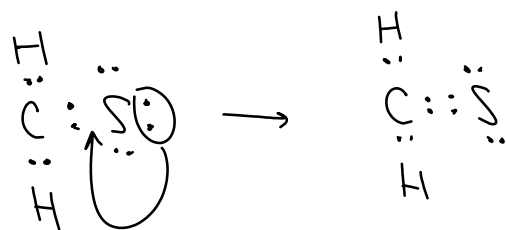


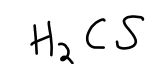
12e<sup>-</sup> → 6 e<sup>-</sup> pairs



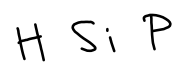
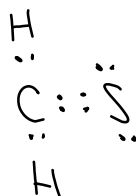
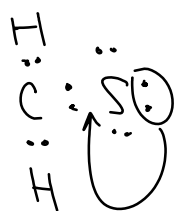


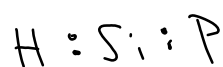
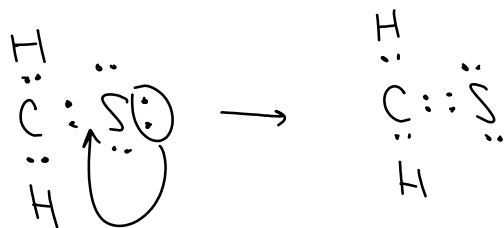
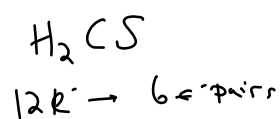
12e<sup>-</sup> → 6 e<sup>-</sup> pairs

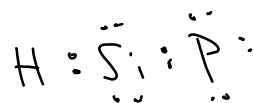
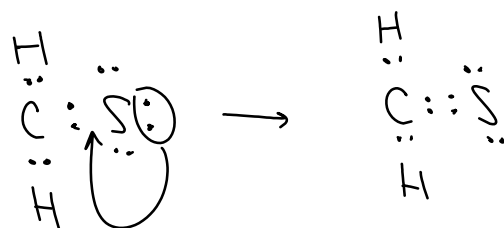
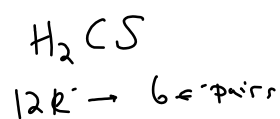


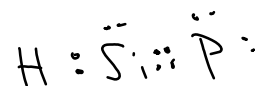
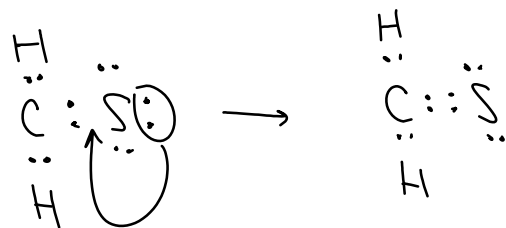
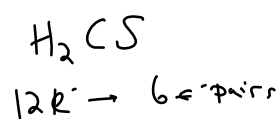


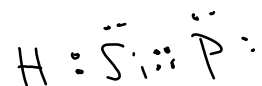
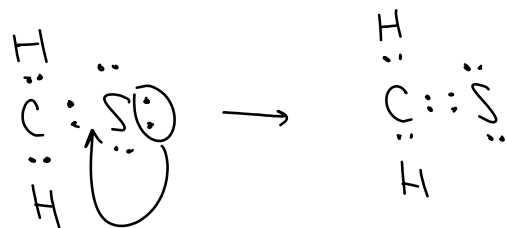
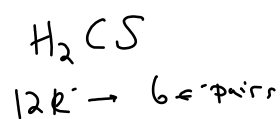
12e<sup>-</sup> → 6 e<sup>-</sup> pairs



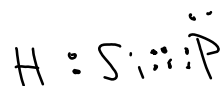
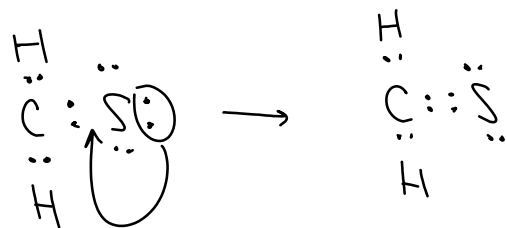
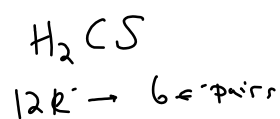




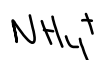
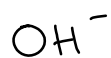




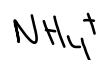
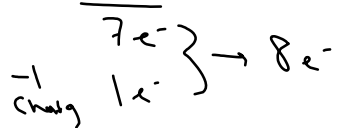
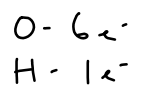
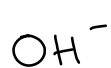




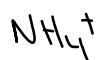
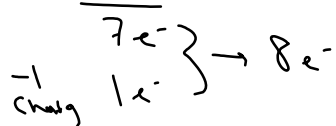
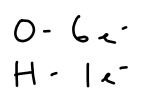
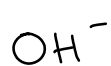
Hydroxide



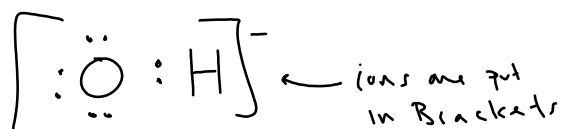
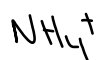
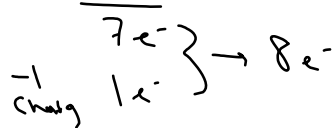
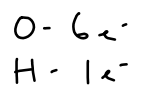
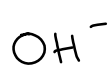
Hydrous Al ions



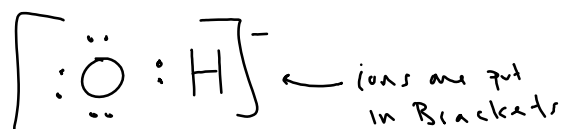
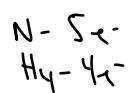
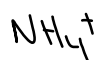
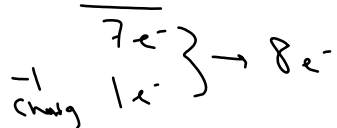
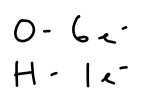
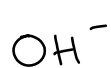
Hydronium



Hydrous Ions



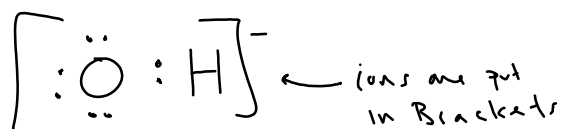
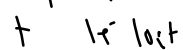
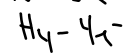
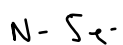
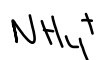
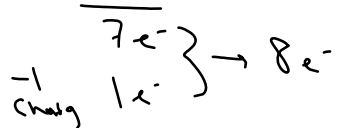
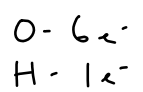
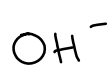
Hydrous Ions



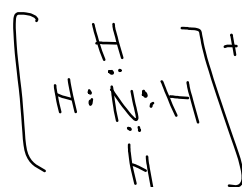
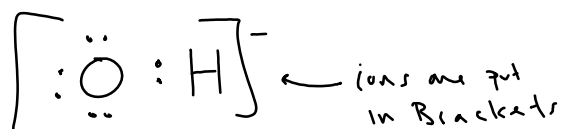
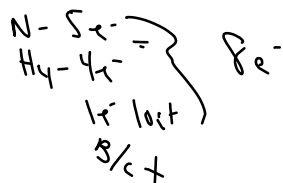
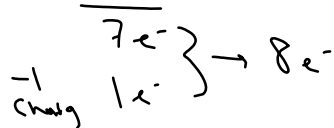
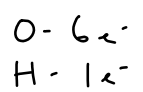
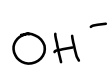
## Ch 6 Notes B.ink

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Hydrous Ions



## Hydrous Ions





Ionic Bonding

Ionic Bonding

Na<sup>+</sup>

Ionic Bonding  
(B/w metals + nonmetals)  
 $\text{Na}^+$

## Ch 6 Notes B.ink

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Ionic Bonding  
(B/w metals + nonmetals)  
 $\text{Na}^+$



## Ch 6 Notes B.ink

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Ionic Bonding  
(B/w metals + nonmetals)

Na<sup>+</sup>

:Cl:

## Ch 6 Notes B.ink

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Ionic Bonding  
(B/w metals + nonmetals)

Na<sup>+</sup>

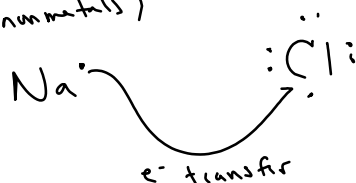
:Cl:

## Ch 6 Notes B.ink

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### Ionic Bonding

(B/w metals + nonmetals)

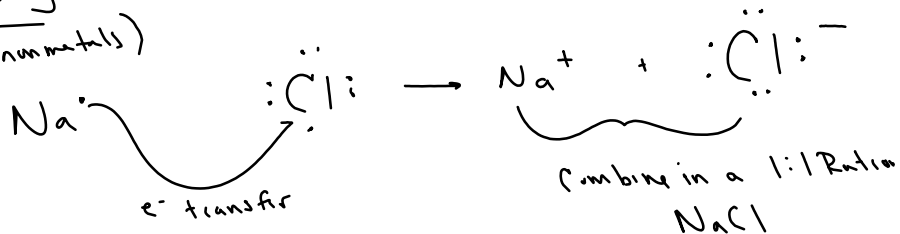


## Ch 6 Notes B.ink

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### Ionic Bonding

(B/w metals + nonmetals)



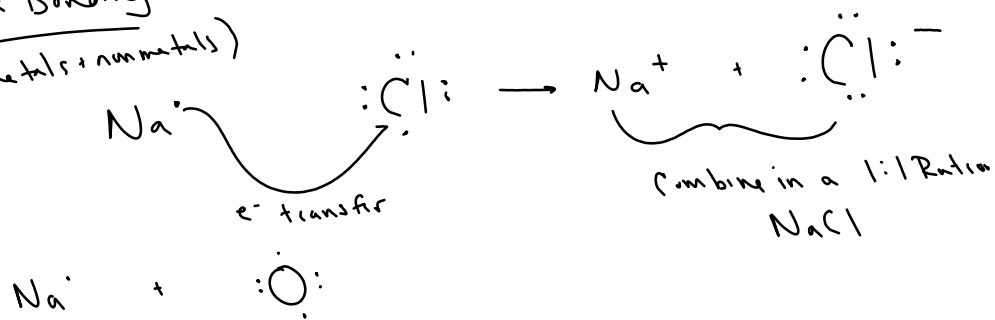


## Ch 6 Notes B.ink

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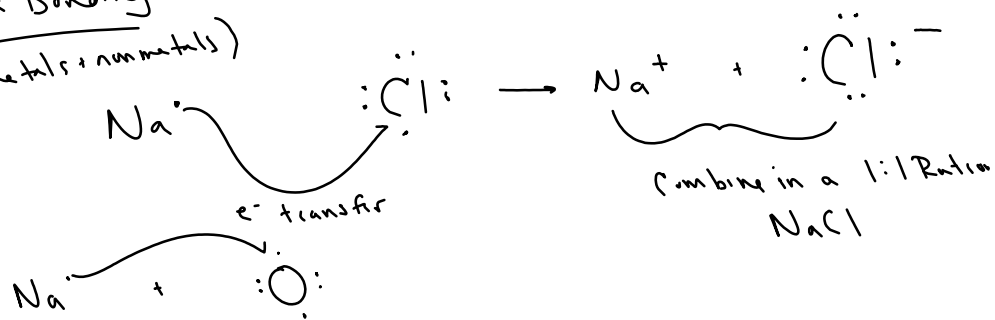
### Ionic Bonding

(B/w metals + nonmetals)



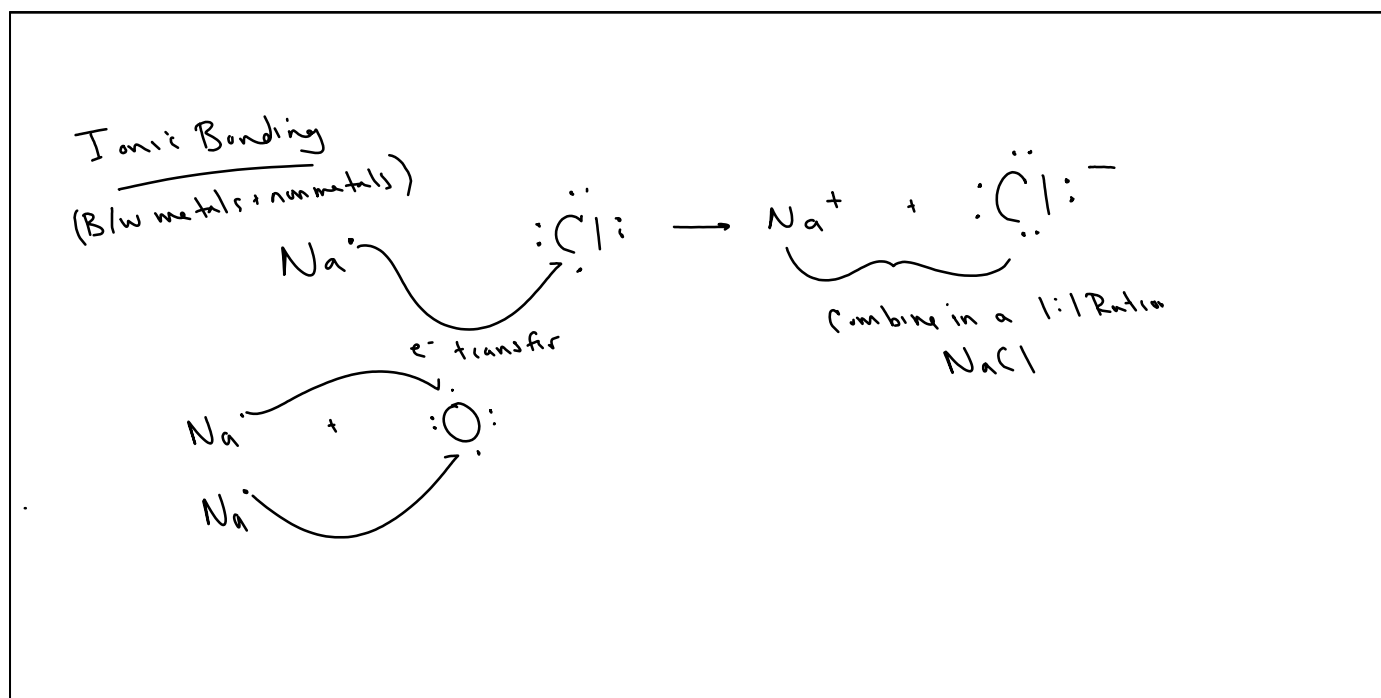
### Ionic Bonding

(B/w metals + nonmetals)



## Ch 6 Notes B.ink

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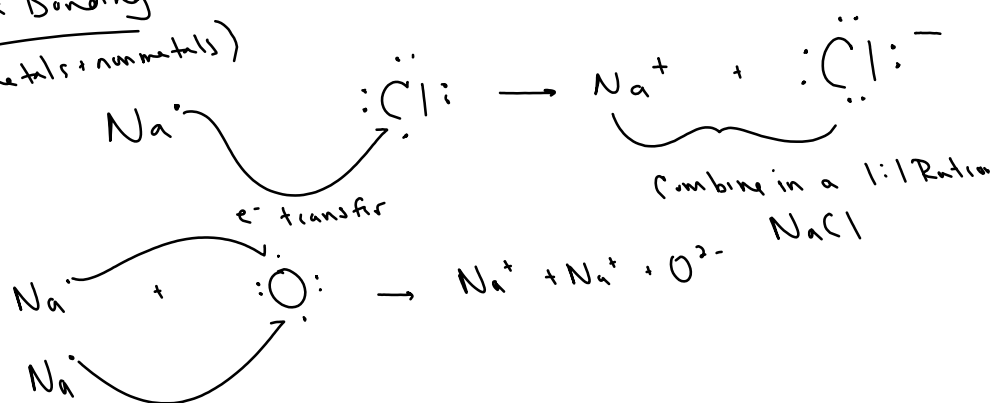


## Ch 6 Notes B.ink

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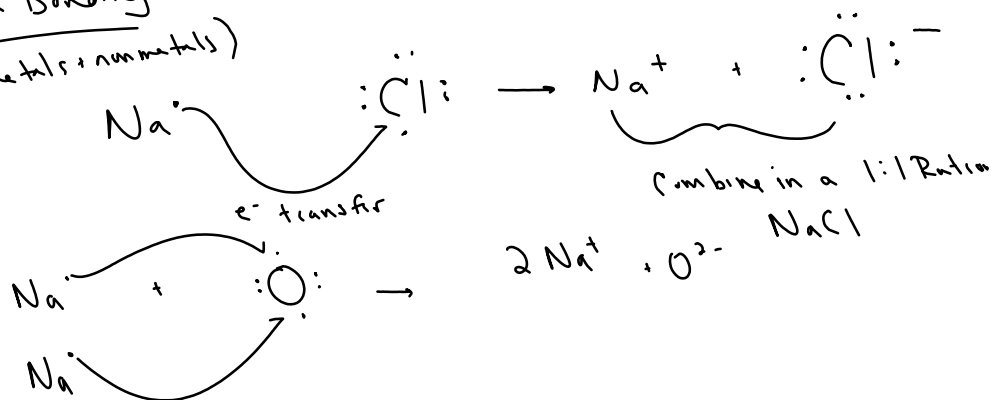
### Ionic Bonding

(B/w metals + nonmetals)



## Ionic Bonding

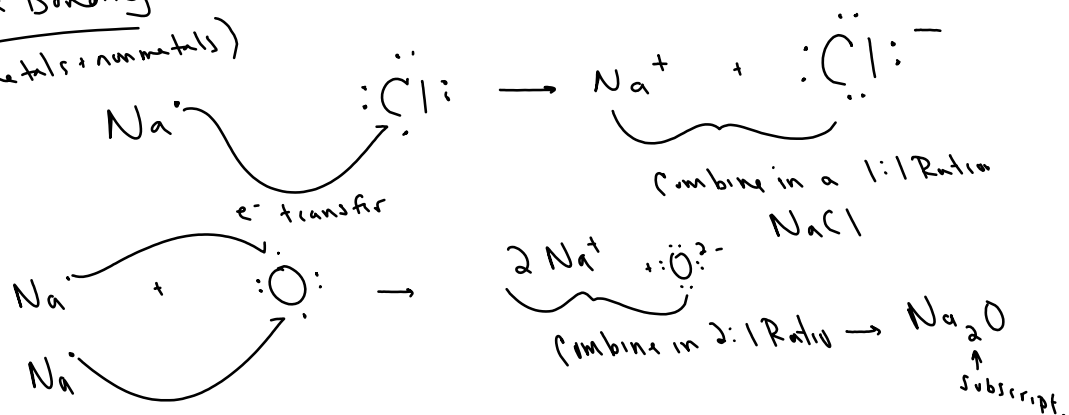
(B/w metals + nonmetals)



## Ch 6 Notes B.ink

### Ionic Bonding

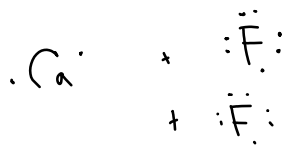
(B/w metals + nonmetals)

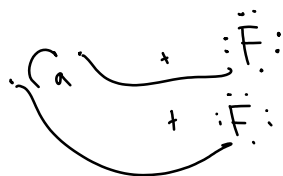


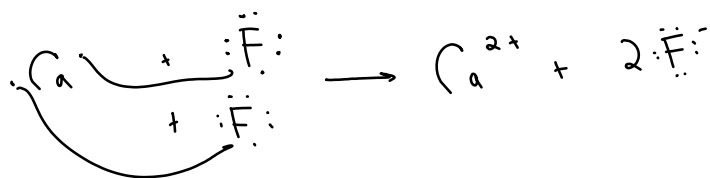
$G_a \times F$

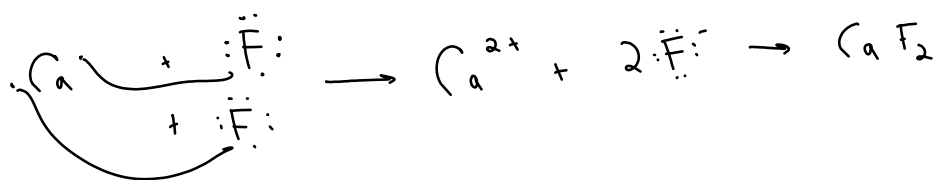


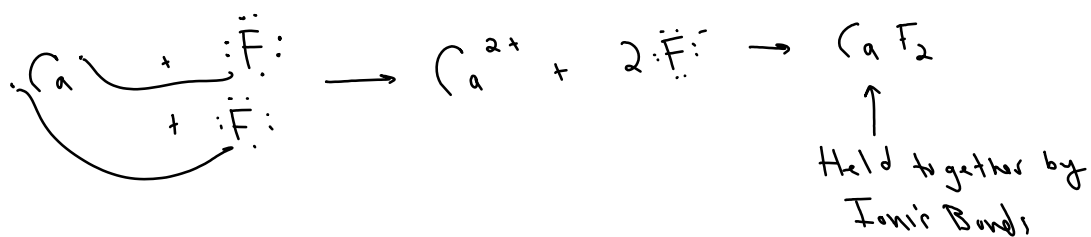


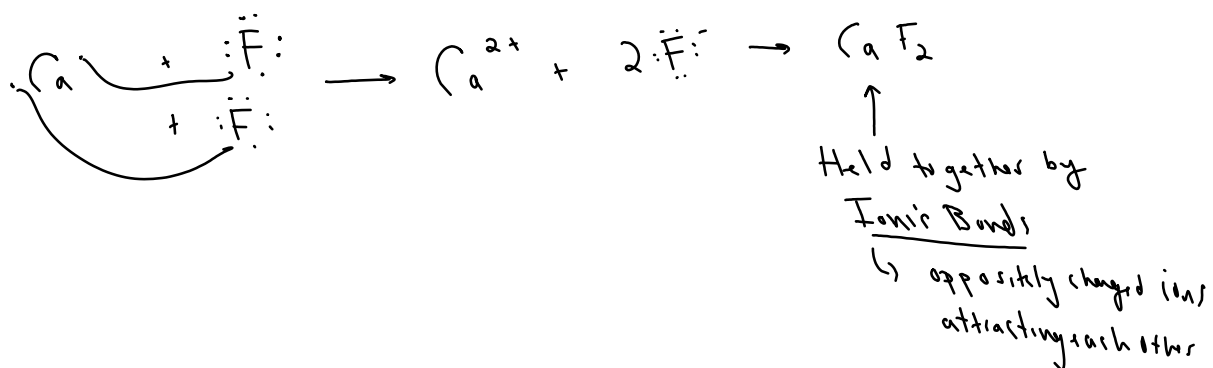












X-ray diffraction Comp  
↳ Exist in a crystal Lattice

Atomic Comp

↳ Exist in a crystal Lattice

↳ highly organized Repeating pattern  
of + & - ions in various arrangements



Ionic Comp

↳ Exist in a crystal Lattice

↳ highly organized Repeating pattern  
of  $+$  &  $-$  ions in various arrangements

multiple  $+$  ions bond  
to multiple  $-$  ions & vice versa

Ionic Comp<sup>s</sup>  
↳ high Melting Points B/c of Lattice

Ionic Comp<sup>r</sup>  
↳ high Melting Points B/c of Lattice  
MP

NaCl	801°C
Sucrose (sugar)	186°C

Ionic Comp<sup>s</sup>  
↳ high Melting Points b/c of Lattice  
MP

NaCl 801°C

Sucrose  
(sugar) 186°C

Ionic Comp<sup>s</sup> are Brittle b/c of  
the crystal lattice

VSEPR

VSEPR  
(3D shapes of covalent molecules)

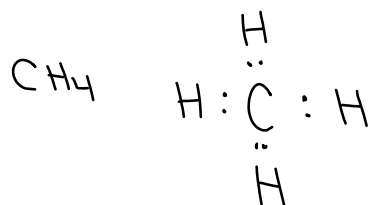
VSEPR  
(3D shapes of covalent molecules)

CH<sub>4</sub>

## Ch 6 Notes B.ink

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VSEPR  
(3D shapes of covalent molecules)



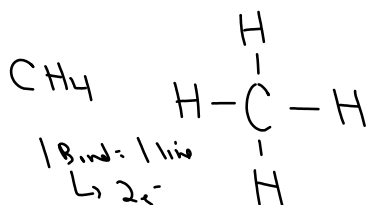


## Ch 6 Notes B.ink

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VSEPR

(3D shapes of covalent molecules)

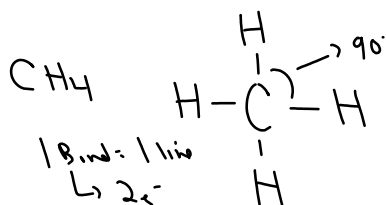


## Ch 6 Notes B.ink

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VSEPR

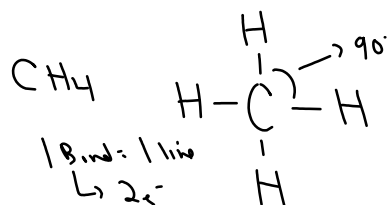
(3D shapes of covalent molecules)



## Ch 6 Notes B.ink

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VSEPR  
(3D shapes of covalent molecules)

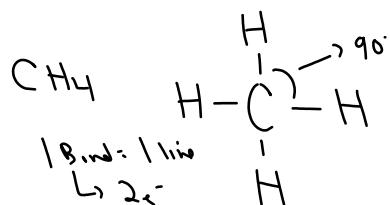


## Ch 6 Notes B.ink

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VSEPR

(3D shapes of covalent molecules)



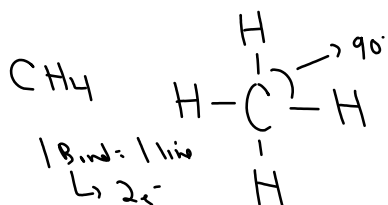
Repulsion b/w the e<sup>-</sup> in  
separate bonds

## Ch 6 Notes B.ink

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VSEPR

(3D shapes of covalent molecules)

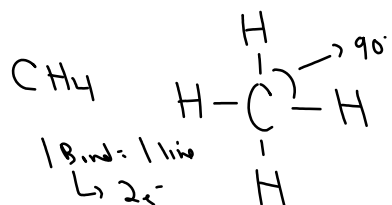


Repulsion b/w the e<sup>-</sup> in  
separate bonds

so Bonds arrange themselves  
to be as far apart as possible

### VSEPR

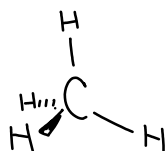
(3D shapes of covalent molecules)



Repulsion b/w the e<sup>-</sup> in  
separate bonds

so Bonds arrange themselves  
to be as far apart as possible  
in 3D

VSEPR  
(3D shapes of covalent molecules)



Repulsion b/w the  $e^-$  in  
separate bonds

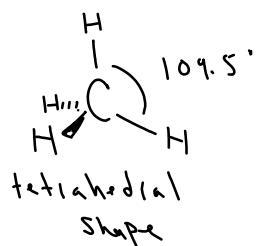
so Bonds arrange themselves  
to be as far apart as possible  
in 3D

## Ch 6 Notes B.ink

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### VSEPR

(3D shapes of covalent molecules)

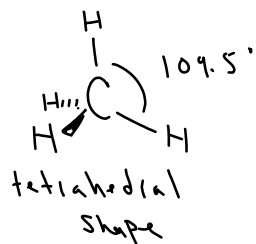


Repulsion b/w the  $e^-$  in  
separate bonds

so Bonds arrange themselves  
to be as far apart as possible  
in 3D



VSEPR - valence shell  $e^-$  pair Repulsion  
(3D shapes of covalent molecules)  $\hookrightarrow$  Molecular Geometries are caused  
by Bonding  $e^-$  Repelling each other



Repulsion b/w the  $e^-$  in  
separate bonds

so Bonds arrange themselves  
to be as far apart as possible  
in 3D

## Ch 6 Notes B.ink

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SEPR Table  
Molecule Type

# of unshared  
e<sup>-</sup> pairs  
on central  
atom

Geometry  
Type

Bond  
<

Ex

Structure

## Ch 6 Notes B.ink

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SEPR Table  
Molecule Type

# of unshared  
e<sup>-</sup> pairs  
on central  
atom

Geometry  
Type

Bond  
<

Ex

Structure

H<sub>2</sub>

## Ch 6 Notes B.ink

---

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	Ex	Structure
		Linear		H <sub>2</sub>	H-H

## Ch 6 Notes B.ink

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<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	Ex	Structure
A <sub>2</sub> (two atoms)		Linear		H <sub>2</sub>	H-H

## Ch 6 Notes B.ink

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<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub> , HCl	H-H, H- $\ddot{\text{Cl}}$ :

## Ch 6 Notes B.ink

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<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub>					

## Ch 6 Notes B.ink

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<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub> ↑ Central atom      ↗ 2 Branches					



## Ch 6 Notes B.ink

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<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub> ↑ Central atom      ↗ 2 Branches				CO <sub>2</sub>	$\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$

## Ch 6 Notes B.ink

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub> ↑ Central atom      2 Branches				CO <sub>2</sub>	$\begin{array}{c} \ddot{\text{O}}=\text{C}=\ddot{\text{O}} \\ \text{B}-\text{A}-\text{B} \end{array}$

## Ch 6 Notes B.ink

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub> ↑ Central atom      ↗ 2 Branches	○	Linear	180°	CO <sub>2</sub>	$\begin{array}{c} \ddot{\text{O}}=\text{C}=\ddot{\text{O}} \\ \text{B}-\text{A}-\text{B} \end{array}$

## Ch 6 Notes B.ink

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<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub>	○	Linear	180°	CO <sub>2</sub>	Ö=C=Ö
AB <sub>3</sub>					

## Ch 6 Notes B.ink

<u>SEPP Table</u>					
Molecule Type	# of unshared e- pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
$A_2$ (two atoms)	—	Linear	$180^\circ$	$H_2$	$H-H$
$AB_2$	○	Linear	$180^\circ$	$CO_2$	$\ddot{O}=C=\ddot{O}$
$AB_3$				$BH_3$	$  \begin{array}{c}  H \\    \\  H-B-H \\    \\  H  \end{array}  \rightarrow  \begin{array}{c}  H \\    \\  H-B-H \\    \\  H  \end{array}  $

## Ch 6 Notes B.ink

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub>	0	Linear	180°	CO <sub>2</sub>	$\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$
AB <sub>3</sub>	0	trigonal planar	120°	BH <sub>3</sub>	$  \begin{array}{c}  \text{H}-\text{B}-\text{H} \\    \\  \text{H}  \end{array}  \rightarrow  \begin{array}{c}  \text{H} \\    \\  \text{H}-\text{B}-\text{H}  \end{array}  $
AB <sub>4</sub>					

## Ch 6 Notes B.ink

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub>	0	Linear	180°	CO <sub>2</sub>	$\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$
AB <sub>3</sub>	0	trigonal planar	120°	BH <sub>3</sub>	$  \begin{array}{c}  \text{H}-\text{B}-\text{H} \\    \\  \text{H}  \end{array}  \rightarrow  \begin{array}{c}  \text{H} \\    \\  \text{H}-\text{B}-\text{H} \\    \\  \text{H}  \end{array}  $
AB <sub>4</sub>				CH <sub>4</sub>	

## Ch 6 Notes B.ink

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub>	0	Linear	180°	CO <sub>2</sub>	$\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$
AB <sub>3</sub>	0	trigonal planar	120°	BH <sub>3</sub>	$  \begin{array}{c}  \text{H}-\text{B}-\text{H} \\    \\  \text{H}  \end{array}  \rightarrow  \begin{array}{c}  \text{H} \\    \\  \text{H}-\text{B}-\text{H}  \end{array}  $
AB <sub>4</sub>				CH <sub>4</sub>	$  \begin{array}{c}  \text{H} \\    \\  \text{H}-\text{C}-\text{H} \\    \\  \text{H}  \end{array}  $



## Ch 6 Notes B.ink

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub>	○	Linear	180°	CO <sub>2</sub>	$\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$
AB <sub>3</sub>	○	trigonal planar	120°	BH <sub>3</sub>	
AB <sub>4</sub>				CH <sub>4</sub>	

## Ch 6 Notes B.ink

<u>SEPR Table</u>					
Molecule Type	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
A <sub>2</sub> (two atoms)	—	Linear	180°	H <sub>2</sub>	H-H
AB <sub>2</sub>	0	Linear	180°	CO <sub>2</sub>	$\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$
AB <sub>3</sub>	0	trigonal planar	120°	BH <sub>3</sub>	$\begin{array}{c} \text{H} \\   \\ \text{H}-\text{B}-\text{H} \\   \\ \text{H} \end{array} \rightarrow \begin{array}{c} \text{H} \\   \\ \text{H}-\text{B}-\text{H} \\   \\ \text{H} \end{array}$
AB <sub>4</sub>	0	tetrahedral	109.5°	CH <sub>4</sub>	$\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array} \rightarrow \begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array}$ 2D                  3D

## Ch 6 Notes B.ink

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SEPR Table  
Molecule Type

# of unshared  
e<sup>-</sup> pairs  
on central  
atom

Geometry  
Type

Bond  
<

Ex

Structure

AB<sub>3</sub>E  
↑

## Ch 6 Notes B.ink

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<u>SEPR Table</u>	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	E <sup>-</sup> x	Structure
Molecule Type 3 branches ↓ AB <sub>3</sub> E ↑            ↑ Central    unshared atom       e <sup>-</sup> pair					

## Ch 6 Notes B.ink

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SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	E <sup>-</sup> x	Structure
Molecule Type 3 branches ↓ $AB_3E$ ↑                      ↑ Central atom    unshared e <sup>-</sup> pair	1			$NH_3$	

## Ch 6 Notes B.ink

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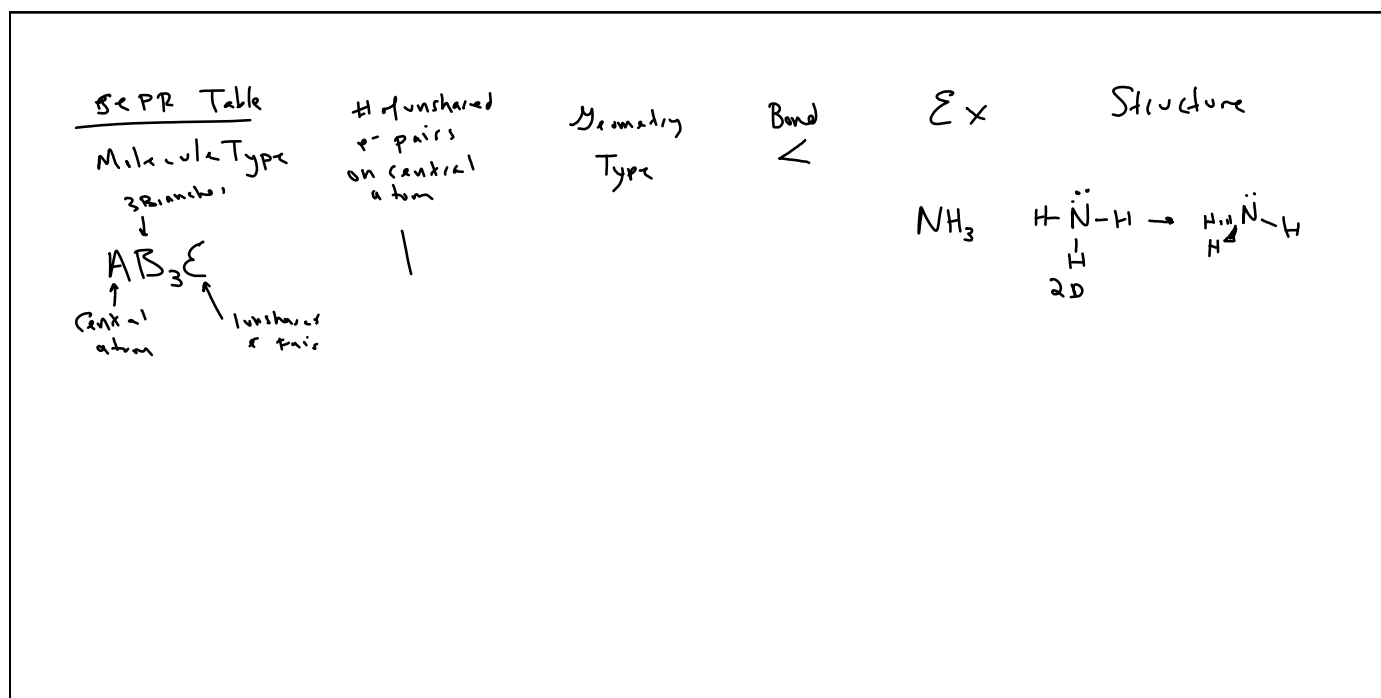
SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	E <sup>-</sup> x	Structure
Molecule Type 3 branches ↓ AB <sub>3</sub> E ↑                      ↑ Central atom    unshared e <sup>-</sup> pair	1 			NH <sub>3</sub>	$  \begin{array}{c}  \text{H} \quad \ddot{\text{N}} \quad \text{H} \\    \\  \text{H}  \end{array}  $

## Ch 6 Notes B.ink

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SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond <	E <sup>-</sup> x	Structure
Molecule Type 3 branches ↓ AB <sub>3</sub> E ↑                      ↑ Central atom    unshared e <sup>-</sup> pair	1 			NH <sub>3</sub>	$  \begin{array}{c}  \text{H} \quad \ddot{\text{N}} \quad \text{H} \\    \\  \text{H}  \end{array}  $

## Ch 6 Notes B.ink





## Ch 6 Notes B.ink

SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
Molecule Type 3 branches ↓ $AB_3E$ ↑                      ↗ central atom    unshared e <sup>-</sup> pair	1	trigonal pyramidal	$107^\circ$	$NH_3$	$  \begin{array}{c}  \text{H} \ddot{\text{N}} - \text{H} \\    \\  \text{H}  \end{array}  \rightarrow  \begin{array}{c}  \text{H} \ddot{\text{N}} - \text{H} \\  \diagup \\  \text{H}  \end{array}  $ 2D

## Ch 6 Notes B.ink

SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
Molecule Type 3 branches ↓ $AB_3E$ ↑                      ↑ central atom    unshared e <sup>-</sup> pair	1	trigonal pyramidal	107°	$NH_3$	$  \begin{array}{c}  \text{H} \quad \ddot{\text{N}} \quad \text{H} \\    \\  \text{H}  \end{array}  \rightarrow  \begin{array}{c}  \text{H} \quad \ddot{\text{N}} \quad \text{H} \\  \diagup \quad \diagdown \\  \text{H}  \end{array}  $ 2D
$AB_2E_2$				$H_2O$	

## Ch 6 Notes B.ink

SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
Molecule Type 3 branches $\downarrow$ $AB_3E$ $\uparrow$ Central atom $\nwarrow$ unshared e <sup>-</sup> pair	1	trigonal pyramidal	$107^\circ$	$NH_3$	$  \begin{array}{c}  H-\ddot{N}-H \\    \\  H  \end{array}  \rightarrow  \begin{array}{c}  H-\ddot{N}-H \\    \\  H  \end{array}  $ 2D
$AB_2E_2$	2			$H_2O$	$H-\ddot{O}-H$

## Ch 6 Notes B.ink

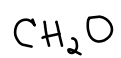
SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
Molecule Type 3 branches ↓ $AB_3E$ ↑                      ↑ Central atom    unshared e <sup>-</sup> pair	1	trigonal pyramidal	107°	$NH_3$	$  \begin{array}{c}  H \quad \ddot{N} \quad H \\    \\  H  \end{array}  \rightarrow  \begin{array}{c}  H \quad \ddot{N} \quad H \\  \diagup \quad \diagdown \\  H \quad \quad H  \end{array}  $ 2D
$AB_2E_2$	2	Bent	104.5°	$H_2O$	$H - \ddot{O} - H$

## Ch 6 Notes B.ink

SEPR Table	# of unshared e <sup>-</sup> pairs on central atom	Geometry Type	Bond Angle	Ex	Structure
Molecule Type 3 branches ↓ $AB_3E$ ↑                      ↑ Central atom    unshared e <sup>-</sup> pair	1	trigonal pyramidal	107°	$NH_3$	$\begin{array}{c} H \\ \vdots \\ H - \ddot{N} - H \\ \vdots \\ H \end{array} \rightarrow \begin{array}{c} H \\ \vdots \\ H - \ddot{N} - H \\ \vdots \\ H \end{array}$ 2D
$AB_2E_2$	2	Bent	104.5°	$H_2O$	$\begin{array}{c} H \\ \vdots \\ H - \ddot{O} - H \\ \vdots \\ H \end{array} \rightarrow \begin{array}{c} H \\ \vdots \\ H - \ddot{O} - H \\ \vdots \\ H \end{array}$

## Ch 6 Notes B.ink

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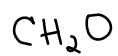
Draw X-ture.

Give Molar Type

Give Geometry

## Ch 6 Notes B.ink

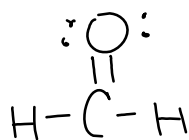
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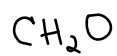


Draw Structure.

Give Molar Mass

Give Geometry

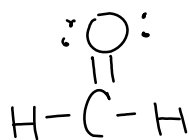




Draw Structure.

Give Molar Type

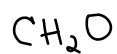
Give Geometry





## Ch 6 Notes B.ink

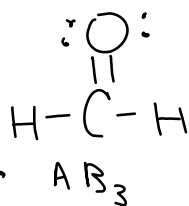
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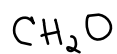


Draw Structure.

Give Molar Type

Give Geometry

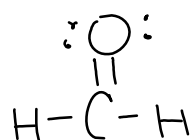




Draw Structure.

Give Molec. Type

Give Geometry



$\text{AB}_3$

trigonal  
planar

Molecular Polarity

Molecular Polarity

↳ Related to Bond Polarity

Molecular Polarity

↳ Related to Bond Polarity

{ Non polar cov.  
Polar cov.

Molecular Polarity

↳ Related to Bond Polarity

{ Non polar cov. - equal e<sup>-</sup> sharing  
Polar Cov.

Molecular Polarity

↳ Related to Bond Polarity

{ Non polar cov. - equal  $e^-$  sharing  
Polar Cov. - unequal  $e^-$  sharing

Molecular Polarity

↳ Related to Bond Polarity

Non polar cov. - equal  $e^-$  sharing  
↳ b/c atoms have same  $e^-$  neg

Polar Cov. - unequal  $e^-$  sharing



Molecular Polarity

↳ Related to Bond Polarity

Non polar cov. - equal e<sup>-</sup> sharing  
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Polar Cov. - unequal e<sup>-</sup> sharing  
↳ different e<sup>-</sup> neg

### Molecular Polarity

↳ Related to Bond Polarity

Non polar cov. - equal e<sup>-</sup> sharing  
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Polar Cov. - unequal e<sup>-</sup> sharing  
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(different elements)

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> Non Polar Molecules

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> Non Polar Molecules  
caused by 1. All bonds being Nonpolar

Non polar cov. - equal e<sup>-</sup> sharing  
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(Different elements)

### Molecular Polarity

↳ Related to Bond Polarity

#### > Non Polar Molecules

caused by 1. All bonds being Nonpolar  
(same element Ex  $N_2$ ,  $O_2$ )

Non polar cov. - equal  $e^-$  sharing  
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↳ different  $e^-$  neg  
(Different elements)

### Molecular Polarity

↳ Related to Bond Polarity

#### > Non Polar Molecules

caused by 1. All bonds being Nonpolar  
(same element e.g.  $N_2$ ,  $O_2$ )

2 Polarity of Polar cov cancels  
B/c of symmetry

Non polar cov. - equal  $e^-$  sharing  
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Polar Cov. - unequal  $e^-$  sharing  
↳ different  $e^-$  neg  
(Different elements)

### Molecular Polarity

↳ Related to Bond Polarity

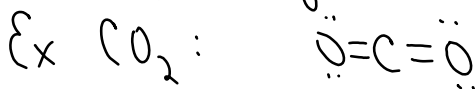
Non polar cov. - equal e<sup>-</sup> sharing  
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caused by 1. All bonds being Nonpolar  
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2 Polarity of Polar cov cancels  
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### Molecular Polarity

↳ Related to Bond Polarity

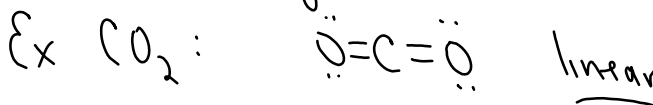
Non polar cov. - equal e<sup>-</sup> sharing  
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### Molecular Polarity

↳ Related to Bond Polarity

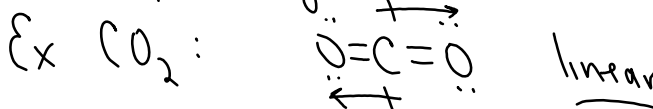
Non polar cov. - equal e<sup>-</sup> sharing  
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Polar Cov. - unequal e<sup>-</sup> sharing  
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### Molecular Polarity

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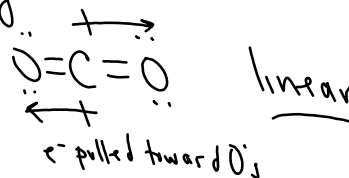
Polar Cov. - unequal  $e^-$  sharing  
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Ex  $CO_2$ :



### Molecular Polarity

↳ Related to Bond Polarity

Non polar cov. - equal  $e^-$  sharing  
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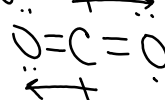
Polar Cov. - unequal  $e^-$  sharing  
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(Different elements)

### > Non Polar Molecules

caused by 1. All bonds being Nonpolar  
(same element Ex  $N_2, O_2$ )

2 Polarity of Polar cov cancels  
B/c of symmetry

Ex  $CO_2$ :



← + →  
 $e^-$  pulled toward O's

symmetry in molecule  
means there is no  
unequal  $e^-$  sharing

linear

## Molecular Polarity

↳ Related to Bond Polarity

Non polar cov. - equal e<sup>-</sup> sharing  
↳ b/c atoms have same e<sup>-</sup> neg

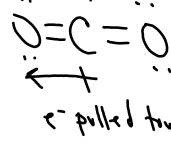
Polar Cov. - unequal e<sup>-</sup> sharing  
↳ different e<sup>-</sup> neg (Different elements)

### > Non Polar Molecules

caused by 1. All bonds being Non Polar (same element Ex N<sub>2</sub>, O<sub>2</sub>)

2 Polarity of Polar cov cancels  
B/c of symmetry

Ex CO<sub>2</sub>:



symmetry in molecule means there is no unequal e<sup>-</sup> sharing

linear

Molecule is Non Polar.

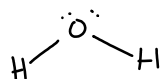
Polar Molecules,  
↳

Polar Molecules,  
↳ Bonds are Polar, & NO symmetry in Geometry

Polar Molecules,

↳ Bonds are Polar, & No symmetry in Geometry

Ex  $\text{H}_2\text{O}$

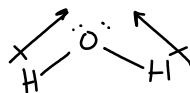




Polar Molecules,

↳ Bonds are Polar, & No Symmetry in Geometry

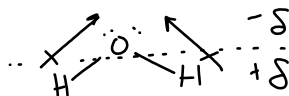
Ex  $\text{H}_2\text{O}$



Polar Molecules,

↳ Bonds are Polar, & No Symmetry in Geometry

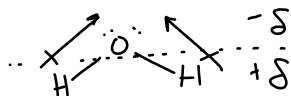
Ex  $H_2O$



Polar Molecules,

↳ Bonds are Polar, & No Symmetry in Geometry

Ex  $H_2O$

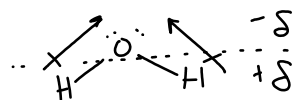


δ<sup>-</sup> lower electronegativity  
Partial charge

Polar Molecules,

↳ Bonds are Polar, & NO symmetry in Geometry

Ex  $H_2O$



$\delta$  - lower case delta  
Partial charge

Molecule is Polar B/c uneven  
charge distribution

Intermolecular Forces

Intermolecular Forces (IMF)

Intermolecular Forces (IMF)  
↳ attractive forces B/w molecules

Intermolecular Forces (IMF)  
↳ attractive forces B/w molecules  
These are NOT Bonds



Intermolecular Forces (IMF)

↳ attractive forces B/w molecules

These are NOT Bonds

weak attractions

Intermolecular Forces (IMF)

↳ attractive forces b/w molecules

These are NOT Bonds

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Dipole-Dipole Forces -

Intermolecular Forces (IMF)

↳ attractive forces B/w molecules

These are NOT Bonds

weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl

Intermolecular Forces (IMF)

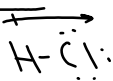
↳ attractive forces B/w molecules

These are NOT Bonds

weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl



## Ch 6 Notes B.ink

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Intermolecular Forces (IMF)

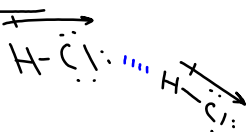
↳ attractive forces B/w molecules

These are NOT Bonds

weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl



Intermolecular Forces (IMF)

↳ attractive forces B/w molecules

These are NOT Bonds

weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl



↗ weak attraction



Intermolecular Forces (IMF)

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These are NOT Bonds

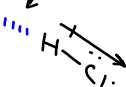
weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl



weak attraction



All IMFs affect MP, BP

Intermolecular Forces (IMF)

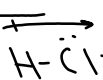
↳ attractive forces b/w molecules

These are NOT Bonds

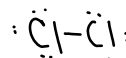
weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl



weak attraction



BP

All IMF's affect MP, BP



Intermolecular Forces (IMF)

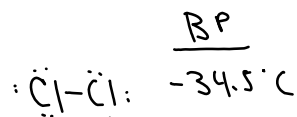
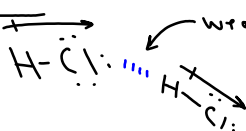
↳ attractive forces B/w molecules

These are NOT Bonds

weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl



All IMF's affect MP, BP

Intermolecular Forces (IMF)

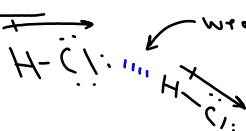
↳ attractive forces b/w molecules

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weak attractions

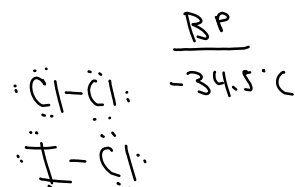
Dipole-Dipole Forces - attractions in Polar Molecules

Ex HCl



weak attraction

All IMFs affect MP, BP



## Ch 6 Notes B.ink

Intermolecular Forces (IMF)

↳ attractive forces B/w molecules

These are NOT Bonds

weak attractions

Dipole-Dipole Forces - attractions in Polar Molecules

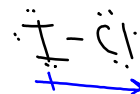
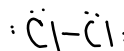
Ex HCl



weak attraction



All IMF's affect MP, BP



BP  
-34.5°C

## Ch 6 Notes B.ink

Intermolecular Forces (IMF)

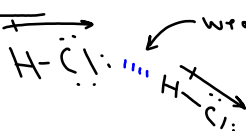
↳ attractive forces B/w molecules

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Dipole-Dipole Forces - attractions in Polar Molecules

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